



UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Tai, Cui Bao	
SERIAL NO.:	10/061,773	ART UNIT: 1714
FILED:	February 1, 2002	EXAMINER: Toomer, C.
FOR:	Combustible Fuel Composition and Method	

To: Commissioner of Patents  
Post Office Box 1450  
Alexandria, Virginia 22313-1450

DECLARATION UNDER RULE 1.132

I, Jose L. Torero, hereby declare:

My educational background is as per my attached Curriculum Vitae.

I am a Mechanical Engineer specializing in combustion and fire safety. I have been involved in the combustion industry for over 16 years and published more than 200 papers on combustion related issues, many of which are directly related to the combustion processes described within this document. I currently hold the BRE Trust/Royal Academy of Engineering Chair in Fire Safety Engineering at the University of Edinburgh and am the Director of the Edinburgh Fire Research Center.

I have reviewed the Examiner's position for the above-identified patent application and, in particular, patent 4,243,393 to Christian. I have analyzed its teachings and advise as follows:

Christian teaches an extruded coal article with a hollow core. Christian states that "wax-like material may be used to facilitate the ignition and burning of the coal and to maintain the flame produced thereby" (col. 4, lines 25-27). The coal article may be dipped in wax for this purpose.

Claims 27-30 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Christian (USP 4,243,393).

Claims 27-30 require "a carbonaceous material having an accelerant-containing portion". It is the Examiner's opinion that the wax in Christian functions as an accelerant. Christian does not disclose an "accelerant" as defined in the instant application, because the wax in Christian does not function in the same manner as the accelerant of the present invention. The accelerant of the present invention is comprised of nitrates that ignite quickly and produce oxygen. Furthermore, they produce energy at a greater rate than Christian's wax. The function of the accelerant in the present invention is to overcome the energy barrier associated with igniting and maintaining the burning of the anthracite mixture through oxygen diffusion. In contrast, the function of the wax is only to spread a flame over the carbonaceous material. The wax will burn and only transfer heat slowly to the carbonaceous material until it begins to gasify its volatiles and sustain a flame independently of the wax.

Nitrates such as barium, sodium and potassium nitrates ( $\text{BaNO}_3$ ,  $\text{NaNO}_3$ ,  $\text{KNO}_3$ ) are unstable compounds that in the presence of heat lead to an exothermic reaction and to the release of oxygen. When embedded in a fuel matrix they will allow rapid ignition and combustion of the fuel. Thus, these materials are commonly labeled oxidants. In contrast, the wax is a stable material that, to sustain a flame, needs to be gasified and,

once it is in the gas phase, ignited.

Nitrates (Oxidants) burn by heterogeneous combustion supported by the heat generated by the Nitrate (Oxidant) and the strong diffusion of oxygen through the fuel surface. Embedding the nitrites within the fuel enhances the surface area exposed to the nitrite and thus makes more effective the heterogeneous combustion reaction.<sup>1</sup> In contrast, wax has to be placed close to the surface (igniting layer) because it does not produce oxygen, therefore it is required to gasify and burn with the oxygen in the air. Wax embedded in the fuel will retard the ignition process while Nitrite (Oxidant) embedded in the fuel will enhance burning.

Common substances such as wax, paraffin, and liquid hydrocarbons lead to the ignition of fuels in a completely different manner. These materials, when subjected to heat, gasify and lead to a homogeneous combustion reaction. The reaction occurs fully in the gas phase and consumes the substance. Nitrites (Oxidants) make the fuel combust following a heterogeneous reaction where the solid fuel is attacked by the oxygen produced by the Nitrite (Oxidant). Wax is characterized by a low ignition temperature and the capability to sustain rapid flame propagation, Nitrites (Oxidants) do not require a low ignition temperature nor the capability of fast propagation, instead they rely on high energy production per unit mass and oxygen generation. The heat produced by the burning of wax slowly heats the fuel matrix, leading to its gasification and burning beyond the complete combustion of such substances.<sup>3</sup> Nitrates (Oxidants) do not gasify the fuel; they diffuse oxygen into the fuel surface where the burning occurs. Nitrites (Oxidants) transfer heat at much higher rates than wax enabling combustion of the fuel

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<sup>1</sup> J.C.Jones, *Combustion Science*, Millennium Books, 1993.

<sup>2</sup> H.L. Gidhar an Arora, A.J., *Combustion and Flame*, 34, 303, 1979.

<sup>3</sup> D.D. Drysdale, *An Introduction to Fire Dynamics*, 2nd Edition, Wiley, 1999.

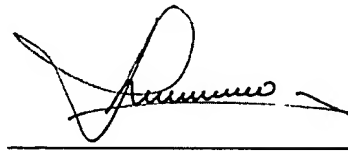
wherever the nitrate is present.

In summary, wax enables combustion of the carbonaceous material by rapidly generating a homogeneous flame above the fuel, slowly heating it until it gasifies and can further sustain a flame. Nitrites (Oxidants) enable the combustion of carbonaceous materials by sustaining a heterogeneous combustion reaction via the rapid and local transfer of oxygen and heat through the surface of the fuel until it can sustain a flame.

Christian does not contain all the attributes of the present invention, and no combination of elements from this Christian would produce the fuel of the claimed invention.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on February 17<sup>th</sup>, 2005

A handwritten signature in black ink, appearing to read 'Jose L. Torero', is written over a horizontal line.

Jose L. Torero



# JOSE L. TORERO

CURRICULUM VITAE: August 2003

## i. Personal Information

Birth Date: March 5, 1964 in Lima, Peru  
Current Position: Reader in Fire Dynamics  
School of Engineering and Electronics  
The University of Edinburgh  
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## a. Education

Ph.D.	University of California, Berkeley	Mechanical Engineering	Nov. 1992
M.S.	University of California, Berkeley	Mechanical Engineering	May 1991
B.S.	Pont. Universidad Catolica del Peru	Mechanical Engineering	Dec. 1988

## b. Professional Activities

2001 - present	Reader in Fire Dynamics School of Engineering and Electronics University of Edinburgh, Edinburgh, Scotland
2002 - present	Adjunct Associate Professor Department of Fire Protection Engineering University of Maryland, College Park, Maryland, USA
2001 - present	Associate Professor (Affiliate-on leave since 2001) Department of Aerospace Engineering University of Maryland, College Park, Maryland, USA
2000 - 2002	Associate Professor
1995 - 2000	Assistant Professor Department of Fire Protection Engineering University of Maryland, College Park, Maryland, USA
1999 - present	Charge de Recherche, 1 <sup>ere</sup> classe (en disponibilité) Centre National de La Recherche Scientifique, France
1996 - 2000	Visiting Researcher National Institute of Standards and Technology Building and Fire Research Laboratory Gaithersburg, MD20899, USA
1995-1999	Charge de Recherche, 1 <sup>ere</sup> classe (detaché) Centre National de La Recherche Scientifique Laboratoire de Combustion et de Detonique ENSMA-Université de Poitiers-UPR9028, France

1993-1995	Charge de Recherche, 2 <sup>ème</sup> classe Centre National de La Recherche Scientifique Laboratoire de Combustion et de Detonique ENSMA-Université de Poitiers-UPR9028, France
1993	Post-Doctoral Fellow European Space Agency at the Laboratoire de Chimie Physique de la Combustion URA 872 au CNRS – Université de Poitiers, France
1992	Research Associate University of California at Berkeley at NASA Lewis Research Center Cleveland, Ohio, USA
1989-1992	Research Assistant Combustion Laboratory University of California at Berkeley, USA

Short Term Visiting Scientist/Professor Appointments

1993, 1994, 1997, 1998	University of Bremen (ZARM), Germany
1995	University of Texas at Austin
1995, 1996, 1998	Instituto Nacional de Tecnica Aeroespacial (INTA), Spain
1999	University of Poitiers, France
2001	University of Aix-Marseille, France
2002, 2003	Ecole des Mines St. Etienne
2002	Pontificia Universidad Catolica de Chile, Chile
2002, 2003	University of California, Berkeley
2003	ENSTIB, Epinal, France
2003	Universite de la Mediterranee, France

External Examiner

2003-Present	Glasgow Caledonian University, Fire Risk Engineering
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## **ii. Fellowship Prizes and Awards**

### **a. Professional**

#### *Main Awards*

1. 1995 NASA-Certificate of Recognition for Outstanding Contributions to Space Shuttle Mission.
2. 1996 Honorary Member: Salamander Fire Protection Engineering Society
3. 2000 Faculty Achievement Award, Office of the President (University of Maryland)
4. 2001 Faculty Service Award, A. J. Clark School of Engineering (University of Maryland)
5. 2001 William M. Carey Award for the Best Paper Presented at the Fire Suppression and Detection Research Application Symposium for the paper "Enhanced Deposition, Acoustic Agglomeration and Chladni Figures in Smoke Detectors," C. Worrell, R.Roby, L. Streit and J.L. Torero.
6. 2002 Harry C. Bigglestone Award for the Best Paper Published in Fire Technology in 2002 for the paper "Measurements of Smoke Characteristics in HVAC Ducts" by Wolin, S. D., Ryder, N. L., Leprince, F., Milke, J.A., Mowrer, F. W. and Torero, J.L., *Fire Technology*, Fourth Quarter, Volume 37, Number 4, pages 363-395, 2001.

#### *Other Awards*

1. 1990 James Marshall Wells Memorial Fellowship (UC Berkeley)
2. 1991 FAO-GIA Fellowship (UC Berkeley)
3. 1992 Department of Mechanical Engineering Fellowship (UC Berkeley)
4. 1993 The European Space Agency Post-Doctoral Research Fellowship
5. 1996 International Travel Fund Fellowship (University of Maryland)
6. 1996 Minta Martin Aeronautical Research Fellowship (University of Maryland)
7. 1997 Minta Martin Aeronautical Research Fellowship (University of Maryland)
8. 2000 Minta Martin Aeronautical Research Fellowship (University of Maryland)

### **b. Educational**

#### *Main Awards*

1. 1996 Lilly-Center for Teaching Excellence Fellowship – Office of the Dean for Undergraduate Studies and the Center for Teaching Excellence.
2. 1996 Outstanding Mentor of the Year Award – Office of Multi-Ethnic Student Education.
3. 1998 E. Robert Kent Outstanding Teaching Award for Junior Faculty - A.J. Clark

School of Engineering.

4. 1999 Outstanding Teacher Award, Office of the Dean for Undergraduate Studies  
(Nominated by Ms. Tershia Pinder).

*Other*

1. 1997 Nominated for Outstanding Faculty Award – Association of Parents.
2. 1997 North American Mobility in Higher Education Travel Award – Undergraduate Student Affairs, A.J. Clark School of Engineering.
3. 1999 Certificate of Appreciation, in Recognition for Generous Service to the Diversity Initiative - Office of Human Relation Programs.
4. 1999 North American Mobility in Higher Education Travel Award – Undergraduate Student Affairs, A.J. Clark School of Engineering.
5. 2001 Nominated for Outstanding Faculty Award – Association of Parents.
6. 2001 Nominated for Outstanding Advisor Award – Association of Parents.

**c. Current Research Programs**

***Space Programs*** – Research experiments that have flown or will fly in long-term microgravity facilities.

*“Laminar Diffusion Flames in Micro-Gravity”*

with Dr. P. Joulain (LCD, CNRS, France)

Funded by: European Space Agency (ESA), CNES

*“Flammability Diagrams of Combustible Materials in Micro-Gravity”*

with Prof. A.C. Fernandez-Pello (UC Berkeley, USA)

Funded by: NASA Glenn Research Center

*Other Programs:*

*“Material Properties Governing Upward Flame Spread”*

with Prof. Steven G. Buckley (University of Maryland, USA)

Funded by: NASA Glenn Research Center

*“Impact of H<sub>2</sub> and CO On Lean Pre-Mixed Hydrocarbon Flames,”*

with Profs. G. Jackson and K. T. Kiger (University of Maryland, USA)

Funded by: NSF

*“Etude sur la détermination des grandeurs physiques qui caractérisent la combustion d’un matériau à l’état solide ou liquide”*

with Prof. D. Morvan (IM2, Marseille, France)

Funded by: IPSN

*“Development of an Engineering Tool for the Determination of Suppression Device Placement in Reduced Gravity Environments,”*

with Dr. Richard Roby and Dr. Michael Klassen (Combustion Science and Engineering, USA)

Funded by: NASA



### **iii. Research, Scholarly, and Creative Activities**

#### **a. Refereed Chapters in Books**

1. H. Y. Wang, J.L. Torero, L. Bonneau and P. Joulain "Numerical Simulation of Ethane-Air Diffusion Flames Established over a Flat Plate Burner: Comparison with Different Gravity Experiments," *Transport Phenomena in Combustion*, S.H. Chan Editor, **2**, Taylor and Francis Publishers, 1141-1152, 1996.
2. J. L. Torero, H. Y. Wang, P. Joulain and J. M. Most "Flat Plate Diffusion Flames: Numerical Simulation and Experimental Validation for Different Gravity Levels," *Lecture Notes in Physics*, Ratke, L. Walter, H. and Feuerbacher, Eds., Springer-Verlag, **464**, 401-408, 1996.(Invited & Refereed)
3. J. T'ien, H-Y. Shih, C-B. Jiang, H.D. Ross, F.J. Miller, A.C. Fernandez-Pello, J.L. Torero and D. C. Walther, "Mechanisms of Flame Spread and Smolder Wave propagation," *Fire in Free Fall: Micro-Gravity Combustion*, H. Ross, Editor, Academic Press Chapter 5, pp.299-418, 2001.

#### **b. Articles in Refereed Journals**

4. J. L.Torero, M. Kitano and A. C. Fernandez-Pello, "Opposed Flow Smoldering of Polyurethane Foam," *Combustion Science and Technology*, **91** (1-3), 95-117, 1993.
5. J. L. Torero, A. C. Fernandez-Pello and D. Urban "Experimental Observations of the Effect of gravity Changes on Smoldering Combustion," *AIAA Journal*, **31** (5), 991-996, 1994.
6. J.L. Torero, L.Bonneau, J.M.Most and P.Joulain "The Effect of Gravity on a Laminar Diffusion Flame established over a Horizontal Flat Plate," *Proceedings of the Combustion Institute*, **25**, 1701-1709, 1994.
7. J. L. Torero, A.C.Fernandez-Pello and M.Kitano "Downward Smolder of Polyurethane Foam," *Fourth International Symposium on Fire Safety Science*, 409-420, 1994.
8. X. Zhou, J. L. Torero, J. C. Goudeau and B. Bregeon "On the Ignition and Propagation of a Reaction Front Through a Porous Fuel: Application to Mixtures Characteristic of Urban Waste," *Combustion Science and Technology*, **110-111** (1-6), 123-146, 1995.
9. J. L. Torero and A. C. Fernandez-Pello "Natural Convection Smolder of Polyurethane Foam, Upward Propagation," *Fire Safety Journal*, **24** (1), 35-52, 1995.
10. L. Audouin, G. Kolb, J. L. Torero and J. M. Most "Average Centerline Temperatures of a Buoyant Pool Fire Obtained by Image Processing of Video Recordings," *Fire Safety Journal*, **24** (2), 167-187, 1995.
11. J. L. Torero, L. Bonneau, J. M. Most and P. Joulain "On the Geometry of Laminar Diffusion Flames Established over a Flat Plate Burner," *Advances in Space Research*, **16** (7), 149-152, 1995.
12. L. Audouin, G. Kolb, J.L. Torero and J.M. Most "Response to the Letter by D.Milov Commenting the Paper Entitled: "Average Centerline Temperatures of a Buoyant Pool Fire

Obtained by Image Processing of Video Recordings" (F.S.J., 24, 2, 1995)," *Fire Safety Journal*, **24** (4), 361-363, 1995.

13. D. P. Stocker, S. L. Olson, D. Urban, J.L. Torero, D. Walther and A.C. Fernandez-Pello, "Small Scale Smoldering Combustion Experiments in Microgravity," *Proceedings of the Combustion Institute*, **26**, 1361-1368, 1996.
14. N. Wu, M. Baker, G. Kolb and J. L. Torero "Ignition, Flame Spread and Mass Burning Characteristics of Liquid Fuels on a Water Bed," *Spill Science and Technology Bulletin*, **3** (4), 209-213, 1996.
15. J. L. Torero and A. C. Fernandez-Pello "Forward Smoldering of Polyurethane Foam in a Forced Air Flow," *Combustion and Flame*, **106** (1-2), 89-109, 1996.
16. L. Brahmi, T. Vietoris, P. Joulain and J. L. Torero, "Experimental Study on the Stability of a Diffusion Flame Established in a Laminar Boundary Layer," *Microgravity Abstracts*, **5**, 80-87, 1998. (in Japanese)
17. L. Brahmi, T. Vietoris, J. L. Torero and P. Joulain, "Determination par camera Infrarouge des distributions de Temperature sur l'Enveloppe d'une Flamme de Diffusion Etablie sur un Bruleur Poreux Plan en Microgravite," *Enthropie*, **215**, 69-73, 1998. (in French)
18. N. Wu, G. Kolb and J. L. Torero, "Piloted Ignition of a Slick of Oil on a Water Sublayer: The Effect of Weathering," *Proceedings of the Combustion Institute*, **27**, 2783-2790, 1998.
19. T. Vietoris, J. L. Torero and P. Joulain, "Experimental Characterization of a Laminar Diffusion Flame in Micro-Gravity," *Journal de Chimie Physique*, **96**, 1022-1030, 1999.
20. J. P. Garo, J. P. Vantelon, S. Gandhi and J. L. Torero "Determination of the Thermal Efficiency Pre-boilover Burning of a Slick of Oil on Water," *Spill Science and Technology Bulletin*, **5** (2), 141-151, 1999.
21. L. Brahmi, T. Vietoris, J. L. Torero and P. Joulain, "Estimation of Boundary Layer Diffusion Flame Temperatures by Means of an Infra-Red Camera under Micro-Gravity Conditions," *Measurement Science and Technology*, **10**, 859-865, 1999.
22. R. T. Long, J. L. Torero, J. G. Quintiere and A. C. Fernandez-Pello, "Scale and Transport Considerations on Piloted Ignition of PMMA," *Sixth International Symposium on Fire Safety Science*, 567-578, 1999.
23. H. Y. Wang, J. L. Torero and P. Joulain, "Calculation of Vertical Parallel Wall Fires with Buoyancy Induced Flow," *Sixth International Symposium on Fire Safety Science*, 671-678, 1999.
24. T. Vietoris, P. Joulain and J. L. Torero "Experimental Observations on the Geometry and Stability of a Laminar Diffusion Flame in Micro-Gravity," *Sixth International Symposium on Fire Safety Science*, 373-386, 1999.
25. S. Leach, G. Rein, J. Ellzey, O. A. Ezekoye and J. L. Torero, "Kinetic and Fuel Property Effects on Forward Smoldering Combustion," *Combustion and Flame*, **120**, 3, 2000.
26. M. K. Anderson, R. T. Sleight and J. L. Torero, "Ignition Signatures of a Downward Smolder Reaction," *Experimental Thermal and Fluid Science*, **21**, 1-3, 33-40, 2000.
27. M. Anderson, R. Sleight and J. L. Torero "Downward Smolder of Polyurethane Foam: Ignition Signatures," *Fire Safety Journal*, **35**, 131-148, 2000.

28. Fernandez-Pello, A.C., Walther, D.C., Cordova, J.L., Steinhaus, T., Quintiere, J.G., Torero, J.L., and Ross, H., "Test Method for Ranking Materials Flammability in Reduced Gravity," *Space Forum*, **6**, 237-243, 2000.
29. T. Vietoris, J. L. Ellzey, P.Joulain, S.N. Mehta and J.L. Torero, "Laminar Diffusion Flame in Micro-Gravity: The Results of the Mini-Texus 6 Sounding Rocket Experiment, *Proceedings of the Combustion Institute*, **28**, 2000.
30. N. Wu, G. Kolb and J. L. Torero, "The Effect of Weathering on the Flammability of a Slick of Crude Oil on a Water Bed," *Combustion Science and Technology*, **161**, 269-308, 2000.
31. M. Roslon, S. Olenick, D. Walther, J.L. Torero, A.C. Fernandez-Pello and H. Ross, "Micro-Gravity Ignition Delay of Solid Fuels," *AIAA-Journal*, v.39, No.12, pp. 2336-2342, Dec. 2001.
32. J.L. Cordova, D. C. Walther, J. L. Torero and A.C. Fernandez-Pello, "Oxidizer Flow Effects on the Flammability of Solid Combustibles," *Combustion Science and Technology*, v. 164, NO. 1-6, pp. 253-278, 2001.
33. Vietoris, T., Joulain, P. and Torero, J.L., "Gas-Gas and Gas-Solid Laminar Flat Plate Diffusion Flames in Micro-Gravity: Structure and Stability," *Micro-Gravity Science and Technology*, **13**, 1, 3-7, 2001.
34. Worrell, C., Gaines, G., Roby, R., Streit, L. and Torero, J.L., "Enhanced Deposition, Acoustic Agglomeration and Chladni Figures in Smoke Detectors," *Fire Technology*, Fourth Quarter, Volume 37, Number 4, pages 343-363, 2001.
35. Wolin, S. D., Ryder, N. L., Leprince, F., Milke, J.A., Mowrer, F. W. and Torero, J.L., "Measurements of Smoke Characteristics in HVAC Ducts," *Fire Technology*, Fourth Quarter, Volume 37, Number 4, pages 363-395, 2001.
36. Torero, J.L., Vietoris, T., Legros, G., Joulain, P. "Evaluation d'un Nombre de Transfert de Masse Réel d'une Flamme Ascendante" *Journal de Physique IV*, **11**, pp. 291-300, 2001. (in French)
37. Milke, J.A., Mowrer, F. W. and Torero, J.L., "Use of Optical Density-Based Measurements as Metrics for Smoke Detectors," *ASHRAE Transactions*, **8**, 2002.
38. Zhou, Y.Y., Walther, D.C., Fernandez-Pello, A.C., Torero, J.L., Ross, H.D., "Theoretical Predictions of Micro-Gravity Ignition Delay of Polymeric Fuels in Low Velocity Flows," *Micro-Gravity Science and Technology*, vol. XII, 4, 2002.
39. Torero, J.L., Vietoris, T., Legros, G., Joulain, P. "Estimation of a Total Mass Transfer Number from Stand-off Distance of a Spreading Flame," *Combustion Science and Technology*, **174** (11-12), pp.187-203, 2002.
40. Rouvreau, S., Cordeiro, P., Joulain, P., Wang, H.Y. and Torero, J.L., "Numerical Evaluation of the Influence of Fuel Generation on the Geometry of a Diffusion Flame: Implications to Micro-Gravity Fire Safety," *Seventh International Symposium on Fire Safety Science*, 283-295, 2002.
41. Dakka, S.M., Jackson, G. S. and Torero, J.L., "Mechanisms Controlling the Degradation of Poly(methyl methacrylate) Prior to Piloted Ignition" *Proceedings of the Combustion Institute*, **29**, 281-287, 2002.
42. Rouvreau, S., Joulain, P., Wang, H.Y., Cordeiro, P. and Torero, J. L. "Numerical Evaluation of Boundary Layer Assumptions Used for the Prediction of the Stand-off

Distance of a Laminar Diffusion Flame” *Proceedings of the Combustion Institute*, **29**, 2527-2534, 2002.

43. T. Rogaume, F. Jabouille, M. Auzanneau, J.C. Goudeau and J.L. Torero, “The Effects of Different Airflows on the Formation of Pollutants During Waste Incineration,” *Fuel*, **81**, 2277-2288, 2002.
44. G. Rein Soto-Yarritu, J.L. Torero and J.L. Ellzey, “Simulacion Numerica de Combustión Latente en Flujo Directo,” *Revista Internacional de Métodos Numéricos para Cálculo y Diseño en Ingeniería*, vol. 18, No. 4, 459-474, December 2002. (in Spanish)
45. J.L. Torero, S.M. Olenick, J.P. Garo and J.P. Vantelon, “Determination of the Burning Characteristics of a Slick of Oil on Water, Spill Science and Technology Bulletin, v.8, 4, pp.379-390, 2003.
46. T. Rogaume, M. Auzanneau, F. Jabouille, J.C. Goudeau and J.L. Torero, “Computational Model to Investigate the Effects of Different Airflows on the Formation of Pollutants During Waste Incineration,” *Combustion Science and Technology*, volume 175 (8), 2003.
47. A.S. Usmani, Y.C. Chung and J.L. Torero, “How Did the World Trade Center Collapsed: A New Theory,” *Fire Safety Journal*, Volume 38, Issue 6, Pages 501-591, 2003.
48. C.L. Worrell, J.A. Lynch, G. Jomaas, R.J. Roby, L. Streit and J.L. Torero, “Effect of Smoke Source and Horn Configuration on Enhanced Deposition, Acoustic Agglomeration and Chladni Figures in Smoke Detectors,” *Fire Technology*, 39, 309-346, 2003.
49. T. Rogaume, F. Jabouille, J.L. Torero, “Computational Model to Investigate the Mechanisms of NO<sub>x</sub> Formation During Waste Incineration,” *Combustion Science and Technology*, (in press).
50. T.Ma, S.M. Olenick, M.S.Klassen, R.J. Roby and J.L. Torero, “Burning Rate of Liquid Fuel on Carpet (Porous Media)” *Fire Technology*, (in press).
51. G. Legros, P. Joulain, J.-P. Vantelon, C. Breillat and J. L. Torero “Comportement Radiatif d’une Flamme de Diffusion se Propageant en Micropesanteur,” *Journal de Mécanique et Industries* (in press). (in French)
52. Bar-Ilan, G. Rein, A.C. Fernandez-Pello, J.L. Torero, D.L. Urban, “Effect of Buoyancy on Forced Forward Soldering,” *Experimental Thermal and Fluid Science*, (in press).
53. F. Mowrer, J. Milke and J.L. Torero, “Comparative Driving Forces for Smoke Movement in Buildings,” *Journal of Fire Protection Engineering* (in press).

**c. Articles in Refereed Proceedings (published or in press)**

54. D. P. Stocker, S. L. Olson, J. L. Torero and A. C. Fernandez-Pello “Micro-Gravity Smoldering Combustion on the USML-1 Space Shuttle Mission,” *ASME-HTD*, **269**, pp.99-110, 1993.
55. J. L. Torero, D. Urban and A. C. Fernandez-Pello, "Experimental Observations of the Effect of Gravity Changes on Smoldering Combustion," 31st Aerospace Science Meeting, Reno, NV, paper **AIAA-93-0829**, January 1993.
56. J. L. Torero, H. Y.Wang, L. Bonneau and P. Joulain, “Numerical Simulation of Ethane-Air Diffusion Flames Established over a Flat Plate Burner: Comparison with Normal and Micro-

- Gravity Experiments," *Zel'Dovich Memorial, International Conference on Combustion*, Moscow, Russia, 1994.
57. J. L. Torero, "A Theoretical Approach to Incineration as an Energy Efficient Way to Deal With Municipal Waste" *XIII Congresso Brasileiro e II Congresso Ibero-Americano de Engenharia Mecânica*, Belo Horizonte, Brasil, December 1995.
  58. J. L. Torero, "A Simplified Theory to Assess the Burning Characteristics of a Slick of Oil on Water", *XIV Congresso Brasileiro de Engenharia Mecânica, COBEM 97*, Bauru, Sao Paulo, Brazil, December 1997.
  59. J. L. Torero, N.J. Bahr, E. J. Carman, "Assessment of Material Flammability for Micro-Gravity Environments" *48th International Astronautical Federation Congress*, Turin, Italy, *IAF-97-J.2.02*, October 1997.
  60. N. Wu, M. Baker, G. Kolb and J. L. Torero, "Ignition and Flame Spread Characteristics of Liquid Fuels on a Water Bed" *20th Arctic and Marine Oilspill Program (AMOP) Technical Seminar*, Vancouver, Canada, vol.2, pp.769-795, June 1997.
  61. G. Kolb, J. M. Most and J. L. Torero "Simulated Pool Fires Tilted by Wind: Flame Characteristics and Geometrical Considerations," *ASME-HTD*, **341-3**, 19-36, 1997.
  62. L. Brahmi, T. Vietoris, P. Joulain, L. David and J. L. Torero, "Experimental observations on the effect of parietal fuel injection on a low velocity reacting flow" *8th International Symposium on Flow Visualization/Optical Diagnostics in Engineering*, Sorrento, Italy, September, 1998.
  63. N. Wu, T. Mosman, S. M. Olenick and J. L. Torero, "Piloted Ignition of a Slick of Oil on a Water Sublayer: The Effect of Weathering and Flash Point," *21st Arctic and Marine Oil Spill Program (AMOP) Technical Seminar*, Edmonton, Canada, vol.2, pp. 633-651, June 1998.
  64. J. Borlik, O. A. Ezekoye and J. L. Torero, "Strain and Heat Loss Modifications to a Counterflow Diffusion Flame," *7th AIAA/ASME Heat Transfer Conference, ASME-HTD*, **357-1**, 115-121, 1998.
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77. A.C. Fernandez-Pello, J.L. Torero and H.D.Ross, "Forced Ignition and Flame Spread Tests," AIAA-2001-5080, ISS Utilization Conference, Orlando, December 2001.
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82. J.-P. Vantelon, B. Lodeho, S. Pignoux, J. L. Ellzey and J. L. Torero "Experimental Study of the Degradation of a Porous Bed of Tires," 3<sup>rd</sup> Mediterranean Combustion Symposium, Marrakech, June 2003.
83. T. Rogaume, F. Jabouille, J.L. Torero, "Computational Model to Investigate the Mechanisms of NO<sub>x</sub> Formation During Waste Incineration, 3<sup>rd</sup> Mediterranean Combustion Symposium, Marrakech, June 2003.

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85. A.Usmani, Y.C. Chung and J.L. Torero, "An Assessment of the Stability of the World Trade Center Twin-Towers in a Major Fire," SFPE-SEI Conference on Designing Structures for Fire, Baltimore, Maryland, September, 2003.

#### **d. Monographs and Reports**

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#### **e. Other Journal Publications**

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111. J. L. Cordova, J. Ceamanos, A. C. Fernandez-Pello, R. T. Long, J. L. Torero and J. G. Quintiere, "Flow Effects on the Flammability Diagrams of Solid Fuels" *4th International Micro-Gravity Combustion Workshop*, NASA Conference Publication 10194, Cleveland, Ohio, May, 1997.
112. J. Sutula, J. Jones, J. L. Torero, J. Borlik and O. A. Ezekoye, "Diffusion Flame Extinction in a Low Strain Flow" *4th International Micro-Gravity Combustion Workshop*, NASA Conference Publication 10194, Cleveland, Ohio, May, 1997.
113. L. Brahmi, T. Viotoris, P. Joulain and J. L. Torero, "Experimental Study on the Stability of a Diffusion Flame Established in a Laminar Boundary Layer" *4th International Micro-Gravity Combustion Workshop*, NASA Conference Publication 10194, Cleveland, Ohio, May, 1997.
114. P. Joulain, and J. L. Torero, "Influence des Forces de Gravite sur la Structure des Flammes de Diffusion Representatives d'Incendies," E.S.A. Workshop on Advanced Combustion Research, Orleans, France, September, 1997.
115. N. Wu and J. L. Torero, "Piloted Ignition of a Slick of Oil on Water," *Eastern States Section of The Combustion Institute*, Fall Technical Meeting, October, 1997.
116. G. Kolb, J. L. Torero, J. M. Most and P. Joulain "Cross-Flow Effects on the Flame Height of an Intermediate Scale Diffusion Flame," *International Symposium on Fire Science and Technology (ISFST-97)*, Seoul, Korea, November, 1997.
117. A. C. Fernandez-Pello, D. C. Walther, J. L. Cordova, T. Steinhaus, J. G. Quintiere, J. L. Torero and H.D. Ross, "Flow Effects on Flammability Diagrams of Solid Fuels: Micro-Gravity Influence on Ignition Delay," Drop Tower Days, JAMIC, Hokkaido, Japan, 1998.
118. P. Joulain, H. Y. Wang and J. L. Torero, "Contribution to the Modeling of Vertical Burning Walls," *3<sup>rd</sup> Asia-Oceania Symposium on Fire Science and Technology*, Singapore, June 1998.
119. L. Brahmi, L. David, T. Viotoris, J. L. Torero and P. Joulain, "Resultats Experimentaux Concernant un Ecoulement Etabli sur une Plaque Plane Avec Injection Parietale Uniforme Pour de Tres Basses Vitesses," *6<sup>eme</sup> Congres Francophone de Velocimetrie Laser*, Institute Saint Louis, France, September 1998.
120. J. G. Quintiere, J. L. Torero, R. T. Long, S. E. Dillon, N. Wu and D. Heater, "Material Fire Properties," international Aircraft Fire and Cabin Safety Research Conference," Atlantic City, New Jersey, November, 1998.
121. T. Steinhaus, S. M. Olenick, A. Sifuentes, R. T. Long and J. L. Torero, "A Method for Assessing Material Flammability for Micro-Gravity Environments," Joint Meeting of the United States Sections, The Combustion Institute, Washington, D.C., March 1999.
122. J. A. Sutula, S. N. Mehta, J. L. Torero and O. A. Ezekoye, "Buoyancy Effects on a Counter-Flow Diffusion Flame," Joint Meeting of the United States Sections, The Combustion Institute, Washington, D.C., March 1999.

123. T. Vietoris, P. Joulain and J. L. Torero, "Flow Considerations on the Stability of a Laminar Diffusion Flame in Micro-Gravity," Joint Meeting of the United States Sections, The Combustion Institute, Washington, D.C., March 1999.
124. J. L. Cordova, D. C. Walther, A. C. Fernandez-Pello, T. Steinhaus, J. L. Torero, J. G. Quintiere and H. Ross, "Flow Effects on the Flammability Diagrams of Solid Fuels: Micro-Gravity Influence on Ignition Delay," *5<sup>th</sup> International Micro-Gravity Combustion Workshop*, NASA Conference Publication, Cleveland, Ohio, May, 1999.
125. J. A. Sutula, J. L. Torero and O. A. Ezekoye, "Experimental Observations on a Low Strain Counter-Flow Diffusion Flame: Flow and Buoyancy Effects," *5<sup>th</sup> International Micro-Gravity Combustion Workshop*, NASA Conference Publication, Cleveland, Ohio, May, 1999.
126. T. Vietoris, P. Joulain, J. L. Torero, "Laminar Diffusion Flames In Micro-Gravity: Experimental Results Leading to Mini-Texus-6," *5<sup>th</sup> International Micro-Gravity Combustion Workshop*, NASA Conference Publication, Cleveland, Ohio, May, 1999.
127. P. Joulain, T. Vietoris and J. L. Torero, "Structure and Stability of a Laminar Flat Plate Diffusion Flame in Micro-Gravity," *International Seminar on Micro-Gravity Combustion*, Tokyo, Japan, August, 1999.
128. S. Olenick, M. Roslon, D. Walther, J. L. Torero, A.C. Fernandez-Pello and H. Ross, "Flow Effects on the Microgravity Piloted Ignition Delay of Solid Fuels" *Proceedings of the International Seminar on Microgravity Combustion*, Institute of Fluid Science, Tohoku University, Sendai, Japan, August, pp 172-181, 1999.
129. P. Joulain, T. Vietoris, L. Brahmi, J. L. Torero, "Etude de la Structure des Flamme de Diffusion Representatives de Situation d'Incendie dans un Environnement de Micro-gravite," *Journées du Programme de Recherche Concertée-Groupement de Recherche 1185*, CNRS, September, 1999.
130. M. Roslon, S. Olenick, D. Walther, J.L. Torero, A.C. Fernandez-Pello and H. Ross "Microgravity Ignition Delay of Solid Fuels in Low Velocity Flows," Spring Meeting of the Western States Sections, The Combustion Institute, Boulder, Colorado, March 2000.
131. P. Joulain, T. Vietoris, P. Cordeiro, S. Rouvreau, "Etude de la Structure des Flamme de Diffusion Representative des Situations d'Incendie dans un Environnement de Microgravite," *Phenomenes de Transport et Transition de Phase en Micropesanteur*, Grenoble, France, June 2000.
132. J.L. Torero and F.W. Mowrer "A New Approach to Interpreting Ignition Test Data," *31<sup>st</sup> International Conference on Fire Safety*, Columbus, Ohio, July 2000.
133. P. Joulain, T. Vietoris and J.L. Torero, "Gas-Gas and Gas-Solid Laminar Flat Plate Diffusion Flames in Micro-Gravity: Structure and Stability," *Drop Tower Days*, Bremen, Germany, September 2000.
134. T. Vietoris, P. Joulain and J.L. Torero, "Study of Micro-Gravity Gas-Solid Combustion in a Sounding Rocket," *First International Symposium on Microgravity Research and Applications in Physical Sciences and Biotechnology*, Sorrento, Italy, September 2000.
135. P. Joulain, H.Y. Wang and J.L. Torero, "Modelisation des Incendies: Cas des feu des Parois Horizontales et Verticales," *La Combustion et sa Modelisation*, Marseille, France, October 2000.

136. C. Worrell, M. Holton, R. Roby, L. Streit and J.L. Torero, "Acoustic Agglomeration and Deposition of Soot in Smoke Detectors, a Method For Determining if a Smoke Detector Alarmed," *NFPA Fire Detection and Suppression Research Application Symposium*, Orlando, Florida, February 2001.
137. S.D. Wollin, N.L. Ryder, F. Leprince, J.A. Milke, F.W. Mowrer and J.L. Torero, "Measurements of Smoke Characteristics in HVAC Ducts," *NFPA Fire Detection and Suppression Research Application Symposium*, Orlando, Florida, February 2001.
138. G. Legros, K. Blase, J.L. Torero and P. Joulain, "Evaluation of a Realistic Mass Transfer Number from Images of an Upward Spreading Flame," 2<sup>nd</sup> Joint Sections Meeting of the Combustion Institute, March 2001.
139. S.M. Dakka, G.S. Jackson and J.L. Torero, "TGA/MS Studies of Thermal and Oxidative Degradation of Poly(methyl methacrylate), 2<sup>nd</sup> Joint Sections Meeting of the Combustion Institute, March 2001.
140. S.M. Dakka, G.S. Jackson and J.L. Torero, "On the Effect of Pyrolysis Kinetics on Ignition Delay Times of Poly(methyl methacrylate)," International Mechanical Engineering Congress and Exposition (IMECE), New York, November 2001.
141. S. Rouvreau, H.Y. Wang, P. Joulain and J.L. Torero, "Simulation Numerique Directe sur les feux de Parois sous Gravite Reduite," Colloque Science de la Matiere et Microgravite, ESPCI, Paris, France, May 2001.
142. P. Cordeiro, G. Legros, P. Joulain and J.L. Torero, "Characterisation de la Structure des Flammes de Diffusion de Type Plaque Plane par Differentes Methodes optiques (emission Visible et Radicalaire OH et CH, PIV)," Colloque Science de la Matiere et Microgravite, ESPCI, Paris, France, May 2001.
143. G. Legros, P. Joulain and J.L. Torero, "Characterization du nom de Mtransfert de Masse par des Images Video," Colloque Science de la Matiere et Microgravite, ESPCI, Paris, France, May 2001.
144. P. Cordeiro, P. Joulain, and J.L. Torero, "Characterization of a Laminar Flat Plate Diffusion Flame in Micro-Gravity Using P.I.V., Visible and CH Emissions," 6<sup>th</sup> *International Micro-Gravity Combustion Workshop*, NASA Conference Publication, Cleveland, Ohio, May, 2001.
145. Y.Y. Zhou, D.C. Walther, A.C. Fernandez-Pello, S. Olenick, J.L. Torero and H. Ross, "Experimental and Numerically Predicted Piloted Ignition Delay in Reduced Gravity," 6<sup>th</sup> *International Micro-Gravity Combustion Workshop*, NASA Conference Publication, Cleveland, Ohio, May, 2001.
146. C. Worrell, J. A. Lynch, G. Jomaas, R. J. Roby, L. Streit and J. L. Torero, "Effect of Smoke Source and Horn Configuration on Enhanced Deposition, Acoustic Agglomeration, and Chladni Figures in Smoke Detectors," *NFPA Fire Detection and Suppression Research Application Symposium*, Orlando, Florida, February 2002.
147. S. Rouvreau, H.Y. Wang, P. Joulain and J. L. Torero, "Numerical Simulations of Gas Diffusion Flames in Micro-Gravity on a Flat Plate in a Flow of Oxidizer Parallel to its Surface: Stand-off Distance and Boundary Layer Assumptions," 9<sup>th</sup> International Symposium on Numerical combustion, Sorrento, Italy, April 2002.

148. T. Rogaume, J. Tezanou, F. Jabouille, and J.L. Torero, "The effects of different combustion regimes on the formation of NO in municipal waste incineration," Joint Meeting of the US Sections of the Combustion Institute, Chicago, March 2003.
149. G. Legros, P. Joulain, J.-P. Vantelon, C. Breillat and J. L. Torero "Comportement Radiatif d'une Flamme de Diffusion se Propageant en Micropesanteur," Congres Française de Mécanique, Nice, France, September 2003.
150. P. Cordeiro, G. Legros, S. Rouvreau, P. Joulain and J. L. Torero, "Detailed Description of the Structure of a Low Velocity Laminar Diffusion Flame in Microgravity," 7<sup>th</sup> International Workshop on Microgravity Combustion, Cleveland, June 2003.
151. A.C. Fernandez-Pello, D. Rich, J.L. Torero and H. Ross, "Flammability Diagrams of Combustible Materials in Microgravity: Effect of Fiber concentration on Polyethylene," 7<sup>th</sup> International Workshop on Microgravity Combustion, Cleveland, June 2003.
152. A.C. Fernandez-Pello, A. Bar-Ilan, G. Rein, D.L. Urban and J.L. Torero, "Forced Forward Smoldering Experiments Aboard the Space Shuttle," 7<sup>th</sup> International Workshop on Microgravity Combustion, Cleveland, June 2003.
153. M. Coutin, A. S. Rangwala, J. L. Torero and S.G. Buckley, "Material Properties Governing Co-current Flame Spread: The Effect of Air Entrainment" 7<sup>th</sup> International Workshop on Microgravity Combustion, Cleveland, June 2003.
154. R. Carvel, D.D. Drysdale and J.,L. Torero, "Fire Behaviour of Composite Walls," 4<sup>th</sup> International Seminar on Fire and Explosion Hazards, Londonderry, September 2003.
155. C. Lautenberger, A. Stevanovic, D. Rich, J. L. Torero , A.C. Fernandez-Pello, "An experimental and theoretical study on the ignition delay time of composite materials," *Western States Fall Technical Meeting*, UCLA, Los Angeles California, USA, October 2003.
156. S. Rangwalla, J. L. Torero and S. G. Buckley, "Towards determination of the B number for co-current flame spread using the Fire Dynamic Simulator (FDS) code: Comparison between model and experiment," *Western States Fall Technical Meeting*, UCLA, Los Angeles California, USA, October 2003.
157. C. Lautenberger, A. Stevanovic, D. Rich, J. L. Torero , A.C. Fernandez-Pello, "Effect of Material Composition on Ignition Delay of Composites," *COMPOSITES 2003 Convention and Trade Show*, Composites Fabricators Association, Anaheim, California, USA, October 2003.

**g. Talks, Abstracts and Other Professional Papers**

**i. Invited Conference Lectures**

158. J. L. Torero, "Laminar Diffusion Flames Established over a Flat Plate Burner under Micro-Gravity Conditions," *International Workshop on Short Term Experiments under Strongly Reduced Gravity Conditions*, Bremen, Germany, July 1994.
159. J. L. Torero, "Diffusion Flames in Micro-Gravity," *Meeting of the Physical Sciences Working Group*, Berlin, Germany, April, 1995.

160. J. L. Torero, "Numerical Simulation of Flat Plate Ethane-Air Diffusion Flames and Experimental Validation at Different Gravity Levels," *9<sup>th</sup> European Symposium on Gravity Dependent Phenomena in Physical Sciences*, Berlin, May 1995.
161. J. L. Torero, *The Emmons Problem: Experimental Results and Progress Leading to a MiniTexus Experiment*, ESA-Sounding Rocket Experiments Workshop, ESTEC, Noordwijk, The Netherlands, September 1998.
162. J. L. Torero, *Material Flammability and Fire Safety*, Society of Fire Protection Engineers, Chesapeake Chapter, Maryland, September, 1998.
163. J. L. Torero, *La Formation de l'Ingenieur Incendie-Programmes Developpes aux Etats Unis et dans d'Autres Pays*, SFPE Chapitre Francaise, Les Salons du Grand Louvre, October 1998.
164. J. L. Torero, *Educación en Ingeniería de Protección Contra Incendios*, Primer Foro Regional NFPA, Lima '99, Lima, Peru, October, 1999.
165. J.L. Torero, *Challenges and Needs in Fire Protection Engineering Research and Education*, European Seminar on Environmental Risks, Niort, France, October 2000.
166. J.L. Torero, "Cooperation and Student Exchange Between the University of Maryland and French Higher Education Institutions," Global E3 Annual Meeting, Lake George, New York, June 2001.
167. J.L. Torero, "The Mass Transfer Number as a Criterion for Spacecraft Material Flammability," *Workshop on Research Needs in Fire Safety for the Human Exploration and Utilization of Space*, NASA Glenn Research Center, Cleveland, Ohio, June 2001.
168. J.L. Torero, "The Role of Fire Science in Fire Investigation," *Fire Safety and Rescue Asia Conference*, Singapore, November, 2001.
169. Torero, J. L., Quintiere, J. G. & Steinhaus, T., "Fire Safety in High-rise Buildings: Lessons Learned from the WTC," *Jahresfachtagung der Vereinigung zur Forderrung des Deutschen Brandschutzes e. V.*, Dresden, Germany, 2002.
170. Torero, J.L. "Fire and the Environment," International Workshop on Environmental Risk Assessment, Damascus, Syria, October, 2002.
171. Torero, J.L., "Scaling of Micro-gravity Combustion Systems, Implications to Spacecraft Fire Safety" European Workshop on Micro-gravity Combustion, Poitiers, France, October 2002.
172. Torero, J.L., "Fire Safety Science in Support of Performance Based Design: Innovation or Just Filling the Gaps?," The Graduate Lecture, The Institution of Fire Engineers, Preston, Lancashire, April 2003.
173. Torero, J.L., "Fire Modeling and Fire Performance," The Rasbash Lecture and ECD Conference, Ministry of Defense, Whitehall, London, UK, June 2003.
174. Torero, J.L. "La Experiencia del World Trade Center," Seminario Donde Hubo Fuego, Que hacemos con las Cenizas, Santiago, Chile, June 2003.
175. Torero, J.L., "L'Approche des Risques en Europe et aux Etats-Unis," Colloque Les risques Industriels & Technologiques, Enjeux Internes et Effets Externes, Bourges, France, October 2003.

### Invited Talks

176. J. L. Torero, "The Effect of Buoyancy on the Geometry of Laminar Diffusion Flames Established Over a Flat Plate Burner," *The University of Texas at Austin*, Texas, U.S.A., February, 1995.
177. J. L. Torero, "Buoyancy Effects on Smoldering of Polyurethane Foam," National Institute of Standards and Technology, Gaithersburg, Maryland, U.S.A. December, 1995.
178. J. L. Torero, *The Role of Micro-Gravity Experiments on Spacecraft Fire Safety* Escuela Tecnica Superior de Ingenieros Aeronauticos, Madrid, Spain, January, 1998.
179. J. L. Torero, *Material Flammability Studies for Micro-Gravity Environments*, National Institute of Standards and Technology, Gaithersburg, Maryland, U.S.A., October 1998.
180. J. L. Torero, "Seguridad Contra-Incendios en Naves Espaciales - Combustion en Micro-Gravedad," *Pontificia Universidad Catolica de Chile*, Santiago, Chile, November 1998.
181. J. L. Torero, "Combustion et Securite d'Incendie," *Ecole National Superieure de Mecanique de d'Aerotechnique*, Poitiers, France, February, 1999.
182. J. L. Torero, "Energy Release Rate: Determination and Application," Danish Technical University, March, 2000.
183. J.L. Torero, "Flammability Criteria Relevant to Material Selection for Spacecraft Applications" Department of Mechanical and Aerospace Engineering, Princeton University, April, 2000.
184. J.L. Torero, "Ignition Signatures of a Smolder Reaction in Polyurethane Foam," IUSTI Marseille, France, July 2000.
185. J.L. Torero, "Fire Safety Engineering: Future Perspectives and their Applications," University of Edinburgh, Edinburgh, Scotland, August 2000.
186. J.L. Torero, "Fire Protection Engineering: Current Accomplishments and Challenges," Ecole National Superieure des Mines de Saint-Etienne, Saint-Etienne, November, 2000.
187. J.L. Torero, "Material Flammability, The Screening of Complex Materials for Complex Applications: The International Space Station," Purdue University, West-Lafayette, Indiana, March 2001.
188. J.L. Torero, "Material Flammability Assessment for the International Space Station," Union College, Schenectady, New York, April, 2001.
189. J.L. Torero, "El World Trade Center: Algunas Preguntas," Pontificia Universidad Catolica de Chile, April 2002.
190. J.L. Torero, "Desarrollo de una Reglamentacion Adecuada en Materia de Seguridad Contra Incendios," Conference on Fire Safety organized by the Vice-President of the Republic, Lima, Peru, November 2002.
191. J.L. Torero, "Conclusiones para una Reglamentacion Adecuada en Materia de Seguridad Contra Incendios," Conference on Fire Safety organized by the Vice-President of the Republic, Lima, Peru, November 2002.
192. J.L. Torero, "Fire Safety Engineering after September 11<sup>th</sup>, 2001," Herriot-Watt University, Edinburgh, November 2002.

193. J.L. Torero, "A Case for the Use of the Mass Transfer Number as a Flammability Criterion," Factory Mutual Global, Massachusetts, USA, June 2003.

iii. Conference Presentations

194. N. Wu, M. Baker, G. Kolb and J. L. Torero, "Burning Characteristics of Liquid Fuels on a Water Bed: Ignition and Flame Spread" *2nd International Conference on Fire Research and Engineering*, NIST Gaithersburg, Maryland, August 1997.
195. L. Brahmi, T. Vietoris, J. L. Torero and P. Joulain "Etude de la Stabilité et de l'Extinction d'une Flamme de Diffusion Laminaire Etablie sur une Bruleur Plat en Micro-Gravité", *13<sup>eme</sup> Congres Francais de Mecanique*, Poitiers, France, September 1997.
196. L. Brahmi, T. Vietoris, J. L. Torero and P. Joulain, "Utilisation d'une Camera Infra-Rouge Pour Determiner les Distributions de Temperature d'une Flamme de Diffusion Etablie Sur une Bruleur Plat en Micro-Gravité" *5<sup>eme</sup> Journees Europeennes de Thermodynamique Contemporaine*, Toulouse, September 1997.
197. L. Brahmi, T. Vietoris, J. L. Torero and P. Joulain, "Etude de la Structure des Flammes de Diffusion Etablies sur une Surface Combustible dans un Environnement a Gravite Reduite," *Journees du Programme de Recherche Concertee-Groupement de Recherche 1185*, CNRS, St.Pierre D'Oleron, May, 1998.
198. J. L. Torero, "Computations and Experiments to Support Fire Investigations: Applying Fire Science in Fire Investigations," *NFPA Fall Meeting*, November, 1999.
199. J.A. Milke, F. W. Mowrer and J.L. Torero, " Duct Smoke Detector Research," NFPA World Fire Safety Congress and Exposition, Anaheim, California, May 2001.
200. S.Wolin, N. Ryder, F. LePrince, J. Milke, F. Mowrer and J.L. Torero, NFPA World Fire Safety Congress and Exposition, Minneapolis, Minnesota, May 2002.
201. J.A. Milke, F. W. Mowrer and J.L. Torero, " Duct Smoke Detector Research: Final Report" NFPA World Fire Safety Congress and Exposition, Minneapolis, Minnesota, May 2002.

i. **Extension Activities and Professional Courses**

1. *Fire Phenomena/Enclosure Fires* – Bureau of Alcohol Tobacco and Firearms, Maryland Fire and Rescue Institute, University of Maryland, August 1998.
2. *Control de Riesgos de Incendio* – Pontificia Universidad Catolica de Chile, Santiago, Chile, November 1998.
3. *Feu et Combustion* – Ecole National Supérieure de Mecanique et d'Aerothechnique (ENSMA), Université de Poitiers, France, March 1999.
4. *Seminaire sur le Management des risques d'Incedie*, Univeriste de Poitiers-Site de Niort, France, January, 2000.
5. *Fire Phenomena/Enclosure Fires* – Bureau of Alcohol Tobacco and Firearms, Maryland Fire and Rescue Institute, University of Maryland, August 2000.
6. *Fire Safety* – Masters of Science Loss Prevention and Risk Management, ENSI-Bourges, Bourges, France, November 2000.

7. *Fire Safety* – Masters of Science Loss Prevention and Risk Management, ENSI-Bourges, Bourges, France, December 2001.
8. *Fire Safety Engineering* – Ecole des Mines St. Etienne, St. Etienne, France, January, 2002.
9. *Fire Investigation* – The University of Edinburgh, April 2002.
10. *Performance Based Design of Fire Safety Systems* – Pontificia Universidad Catolica de Chile, June 2002.
11. *Introduction to Fire safety Engineering*, – Ecole des Mines St. Etienne, St. Etienne, France, February, 2003.
12. *Fire Investigation* – The University of Edinburgh, March 2003.
13. *Fire Dynamics and Fire Safety Engineering Design* - The University of Edinburgh, March 2003.
14. *Ingenieria de Proteccion Contra el Fuego* - Pontificia Universidad Catolica de Chile, June 2003.

#### **iv. Service**

##### **a. Professional Service**

##### **i. Membership in Professional and Honorary Societies**

The Institution of Fire Engineers (IFE)  
 Salamander Fire Protection Engineering Honor Society (*Honorary*)  
 American Society of Mechanical Engineers (ASME)  
 American Institute of Aeronautics and Astronautics (AIAA)  
 Combustion Institute  
 International Association for Fire Safety Science (IAFSS)  
 Society of Fire Protection Engineers (SFPE)  
 National Fire Protection Association (NFPA)  
*NFPA-Latin American Section*

##### **ii. Unpaid Professional Activities**

1. Fire Technology Journal – Editorial Board, (2002-Present)
2. Fire Safety Journal – Editorial Board (2003- Present)
3. American Institute of Aeronautics and Astronautics (AIAA)
  - Member of the Micro-Gravity and Space Processes Technical Committee (1998-Present)
  - 37<sup>th</sup> AIAA Aerospace Science Meeting/13<sup>th</sup> Microgravity Science and Space Processing Symposium - Combustion Science Session Chair, 1999.
  - 38<sup>th</sup> AIAA Aerospace Science Meeting/14<sup>th</sup> Microgravity Science and Space Processing Symposium - Combustion Science Session Chair, 2000.
  - 39<sup>th</sup> AIAA Aerospace Science Meeting/15<sup>th</sup> Microgravity Science and Space Processing Symposium - Combustion Science Session Chair, 2001.
4. Combustion Institute
  - British Section: Committee Member (2002-Present)



- Colloquium Chair –Fire and Explosions – 30<sup>th</sup> International Symposium on Combustion, Chicago, Illinois, USA (2004).
  - International Center for Heat and Mass Transfer, Mediterranean Combustion Symposium (1999) - Session Chair (Fire & Explosions).
  - 2<sup>nd</sup> Joint Sections Meeting of the Combustion Institute, Session Chair (Fire Research), March 2001.
5. European Space Agency (ESA).
    - Peer Review Panels (1993-Present).
  6. International Association for Fire Safety Science (IAFSS)
    - International Committee (2002-Present)
    - Program Committee, 8<sup>th</sup> International Symposium , Beijing, China, 2005.
    - Organizing Committee and Session Chair, 6<sup>th</sup> International Symposium, Poitiers, France, 1999.
    - Web Page Manager.
    - Publication Committee, 4<sup>th</sup> International Seminar on Fire and Explosions Hazards, Londonderry, September, 2003.
    - Nominating Committee Member (2001-Present)
  7. NATO-International Science and Technology Center – ISTC Program
    - Review of the Program: Experimental and Theoretical Investigation on Filtration Combustion-Ignition and Development of a set of Criteria for Fire and Explosion Safety at some Industrial and Agricultural Enterprises (*Prof. G. Manelis et al. Institute of Chemical Physics, Russian Academy of Science, Chernogolovka, Russia*), September 1998.
    - Review of the Program: Experimental and Theoretical Investigation of a Procedure for Solid Waste Incineration Based on Filtration Combustion (*Dr. J.P. Vantelon (ENSMA, France), Dr. S. Pignoux (CRITT, University of Poitiers, France), Prof. G. Manelis, (Russian Academy of Science, Chernogolovka, Russia)*), July 2000.
  8. National Aeronautics and Space Administration (NASA)
    - Peer Review Panels (1995-present)
    - HEDS-Mars or Bust, Fire Safety Group (1997)
    - Fires Safety Working Group (2001)
  9. National Institute of Standards and Technology (NIST)
    - Office of Technology Innovation-Patent Reviewer
  10. National Science Foundation (NSF)
    - Proposal Reviewer
  11. The World Bank
    - Consultant on Tropical Forest Fires -Environmental and Social Sustainable Development-Latin and the Caribbean Region
  10. American Society of Mechanical Engineers
    - Member of the K-11 Committee on Fire and Combustion (2000-Present)
  11. American Institute of Chemical Engineers

- Session Chair – Heat Transfer in Porous Media, 35<sup>th</sup> International Heat Transfer Conference, Anaheim, California, 2001.

12. Republic of Peru – Special Advisor to the Vice-President of Peru

iii. Reviewing Activities

International Association for Fire Safety Science  
 Fire Safety Journal  
 Fire Technology Journal  
 The Combustion Institute  
 Combustion and Flame  
 Combustion Science and Technology  
 Construction and Building Materials  
 ASME-Heat Transfer Division  
 AIAA Journal  
 AIChE-Heat Transfer Division  
 Measurement Science and Technology  
 Microgravity Science and Technology  
 ABCM - Associação Brasileira de Ciências Mecânicas  
 Journal of Physics:D-Applied Physics  
 International Journal of Thermal Sciences  
 Journal de Chimie Physique  
 Journal de Mecanique et Industries